

## 12. Tourism and terrorism: the national and interregional economic impacts of attacks on major US theme parks

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This chapter is one of a series of studies by members of the Economic Modeling Group at CREATE on the economic impact of a variety of terrorist attacks in the United States. These studies use either or both of two economic impact models, SCPM (the Southern California Planning Model) and NIEMO (the National Interstate Economic Model). This research uses only the latter model and traces the inter-regional economic effects of attacks on major theme parks (13, including two clusters) located in a modest number of states (eight). The theme parks are identified by state but not by metropolitan area to mask specific identity. It is important to note that our results are underestimates because our analysis, by focusing on the major theme parks, ignores some of the smaller parks. We have also omitted one park that would have passed the scale threshold. We left it out because the theme park was a relatively minor component of economic activities at the site.

### NIEMO

The details of the model used in this analysis (NIEMO) are explained in a parallel paper, a version of which is published in this book (Park et al., 2007, Chapter 11 in this book) so only a brief description is offered here, just enough for the paper to stand independently. The model revives an approach adopted in the late 1970s and the early 1980s (Polenske, 1980; Jack Faucett Associates, 1983), the development of a MRIO (multi-regional input-output) model. Our version combines state-level data from the

IMPLAN input–output models with inter-regional trade flows based on the Commodity Flow Survey (CFS) aggregated to 47 economic sectors over 52 regions (50 states, Washington, DC and the ‘Rest of the World’). This results in an MRIO matrix with almost 6 million cells. Construction of the model involved substantial data assembly and considerable data manipulation.

More recently, there have been two attempts to estimate inter-regional trade flows using data from the 1997 Commodity Flow Survey (CFS). Jackson et al. (2004) used IMPLAN data to adjust incomplete CFS information primarily by adopting gravity models constrained via distance. The second attempt (Park et al., 2007) is the foundation of this study. It uses the same basic data sources, but adopts a different estimation approach to update missing CFS data and a doubly-constrained Fratar model (DFM) to estimate the MRIO matrix.

Constructing NIEMO requires two basic kinds of tables: industrial trade coefficients tables and regional inter-industry coefficients tables. While trade tables by industry are difficult to construct because of incomplete information in the CFS data, the inter-industry tables present fewer problems because reliable data are available from IMPLAN at the state and industry levels. For details of the procedure used to estimate values for the empty cells in the trade flow matrix, see Park et al. (2007). A temporary problem is that the currently available 1997 CFS data had to be updated to match the 2001 IMPLAN data. The availability of the 2002 CFS data will permit a direct match with 2002 IMPLAN data, although because of sample size there are questions about the adequacy of the new data. Once initial trade flow matrices are estimated for sectors based on a reconciliation of CFS, IMPLAN and SCPM data, these can then be iteratively refined via a Fratar model. However, the conventional Fratar model cannot estimate the diagonal (intrastate flow) values, so NIEMO incorporates a DFM (doubly-constrained Fratar Model) to supplement the off-diagonal flow estimates from the standard Fratar model, providing consistent estimates for on- and off-diagonal values.

## **DIRECT AND INDIRECT BUT NOT INDUCED IMPACTS**

Usually, input–output models measure the direct (final demand), indirect (intermediate input flows) and induced (secondary consumption associated with direct and indirect employment) effects of changes in economic activity. In applying NIEMO we have chosen to measure the direct and indirect impacts only, for several reasons. First, it is a convention in MRIO to ignore induced effects (Miller and Blair, 1983), presumably because

induced consumption is less likely to cross inter-regional, for example interstate, boundaries. Second, although there are local induced impacts associated with local indirect effects, the local and the imported indirect impacts are typically allocated in a MRIO model via some assumption that falls short of the accurate allocations of the 'ideal' inter-regional input-output model. For example, imported inputs of an origin sector are allocated to a particular destination sector in the same proportion as local inputs. Third, in the specifics of the theme park application, there may be positive induced effects in origin states associated with negative direct effects in theme park states. In other words, if would-be visitors to the theme parks stay home they may spend some of their tourist money on additional consumption. This is not a conventional induced impact of the kind measured in input-output models because it is not a secondary consumption effect resulting from employment change. For these reasons, we chose not to measure induced impacts, even if the net effect is to generate under-bounded estimates.

The direct impacts in this research are not limited to theme park expenditures. Overnight visitors to theme parks spend money on accommodation and often on transportation (such as rental cars), and all visitors buy food and often shop. Our estimates include these expenditures. However, we do not include air transportation because of the difficulty of assigning impacts to individual states since most have major operations in several states, not merely the headquarters state. However, the maximum impact would be sizeable, about \$11.85 billion over the 18-month recovery period assumed in our base scenario.

## TERRORISM AND TOURISM

There has never been a major terrorist attack on any tourist site in the United States. The attack of domestic origin by Eric Rudolph in Centennial Park, Atlanta, during the 1996 Olympic Games is the closest approximation. Consequently, we have no domestic history on which to construct feasible scenarios, so we adopt international precedents as a template. We have chosen to analyze a relatively simple type of attack: a large conventional bomb attack at a major theme park. Our focus is on economic impacts, so we do not explore the potential deaths and injuries and damage to tourist facilities and infrastructure. The scale of attack that we have in mind might kill about 20 people, injure ten times as many, and destroy sufficient tourist attractions and facilities to close at least part of a theme park for a few months during reconstruction, and the park overall for perhaps the first month. Our best estimate is that in terms of human and infrastructure

impacts, this would be a \$250 million event, and thus relatively small in terms of potential terrorist events. In any event, our analysis is restricted to economic impacts, specifically business interruption. We leave it to others to estimate the human and physical infrastructure costs of terrorist events. In our view, the human and infrastructure costs would be swamped by the long-term blow to the theme park component of the tourist sector as visitors stayed away in droves out of fear. A major research task is to estimate the recovery period. We discuss this important but difficult task below.

Another key point is that the economic losses we report in our main findings would be gross, not net, losses. However, this may be based on an unreasonable assumption because tourists would not necessarily stay at home but would substitute other, presumably safer, destinations or alternatively (not examined here) spend vacation savings on other expenditures. To capture the possibility of diversion, we explore one scenario that is not meant to be very realistic, merely illustrative. We assume that all the daily visitors to the theme parks stay home while the overnighters substitute visits to national parks, broadly defined to include some national monuments, national historical parks and national resort areas. In this scenario, then, there are net losses but also some redistribution of tourist revenues from some locations and sites to others, often in different states.

Drakos and Kutan (2003) hypothesize a 'zero sum game' in which total tourist revenues remain the same, but tourists switch from destinations affected by terrorism to others that are currently considered safe. Their study looked at tourism in Greece, Turkey and Israel, with Italy included as a control destination not affected by terrorism in recent years. A terrorist incident in Greece was estimated to reduce the country's market share among the four destinations by 1 percent. Specifically, in our substitution scenario, we assume that the 55 percent of total visitors who are day trippers to the theme parks stay home while the 45 percent of overnight visitors to theme parks are allocated to a fairly comprehensive group of national parks and similar nationally designated destinations. These shifts are allocated in proportion to the national parks' most recent visitor rolls.

We explore a range of alternative attacks, not simultaneous attacks. In this chapter, we are not identifying specific theme parks, but are looking at some of the major theme parks distributed across eight states. Also, in a few cases several theme parks are located in the same metropolitan region; we refer to these as 'clusters'. We hypothesize that an attack at one theme park in a cluster will have more of an impact on other theme parks in the cluster than on theme parks outside the cluster, for example in other states. Our rationale for studying several attacks in several states is to illustrate the capacity of our national interstate model (NIEMO) to trace multi-regional economic impacts from any source of changes in final demand.

Our expectation is that the theme park sector of US tourism would take a long time to recover from a terrorist attack on a single theme park, and that the economic impacts would be nationwide in scope. There are several reasons for this view. One is the role played by theme parks in shaping the American psyche. Another is our focus on protecting children who form a sizeable share, perhaps the majority, of theme park visitors. A third is the concept of 'probability neglect'. This concept means that for psychological reasons we may suffer from fear that exaggerates risk and discounted harm, because this fear fails to take sufficient account of the low probability of being a victim. The same phenomenon explained some of the downward trend in air travel after 9/11. A fourth reason is the power of the 'displacement effect'. There are so many tourist substitutions available that it is easy to cancel (or postpone) a theme park trip and go somewhere else. We explore the national parks case that we justify in terms of the argument that lower densities reduce risk, but there are a wide range of alternatives to theme park visits such as a beach holiday, a motoring holiday, a foreign trip, and many others.

## INTERNATIONAL EVIDENCE

In the absence of prior episodes in the United States, we decided to look at the evidence from international terrorist attacks on tourist sites. However, the previous literature on tourism recovery from terrorism is relatively thin (Aly and Strazicich, 2000; Pizam and Smith, 2000). Drakos and Kutan (2003) present evidence for a relatively short time period (1996–99) on the recoveries from tourist attacks in three countries: seven months in Greece and Turkey and four months in Israel. The shorter time period in Israel probably reflects a degree of immunity and reduced sensitivity for residents, and even for tourists, associated with the greater frequency of terrorist events. This raises a more general point: infrequency combined with a larger attack in the United States might make for a longer recovery period.

A related point to the scale issue is that what seems to count most in terms of impact is not the number of incidents but the number of fatalities. Moreover, the negative relationship between tourist revenues and the number of fatalities appears to be non-linear. Another approach, adopted by Enders and Sandler (1991), is to calculate the number of international tourists deterred by each terrorist incident. In their study of Spain, they calculated 140 000 tourists deterred by each Basque attack. This results in a second calculation that in 1988, with 5.392 million foreign tourists visiting Spain and 18 terrorist incidents, there would have been 50 percent more tourists without them. Finally, Frey et al. (2004) surveyed a range of studies

with divergent results, with recovery periods as short as 2–3 months or as long as 18–21 months.

We decided to use the extreme attacks in Luxor (Egypt) in 1997 and in Bali (Indonesia) in 2002 as the best predictors of the recovery phase of a theme park attack in the United States. It is too early to evaluate the repercussions of the more recent attacks in Egypt in Taba in October 2004 and Sharma el Sheikh in July 2005, but we expect the recovery period to be broadly similar. The principal reasons for these choices are the scale of the attacks and the quality of the data. A monthly data series for international visitors is available in both cases. Moreover, the results of the two cases are broadly consistent with each other. In both cases, the number of visitors declined precipitously immediately after the attacks and then recovered very slowly over the next six months. The somewhat different example of the post-tsunami recovery of Phuket in Thailand after December 2004 is also consistent with this finding. This was the short-term impact. In the Bali case, annual tourism did not return to the pre-attack levels until 2004, and monthly data did not consistently (month after month) exceed the pre-attack levels until 18 months after the attack.

Of course, in the absence of a historical record, any scenario is little better than a hypothetical guess. Nevertheless, it is useful as an illustration, and the scenario we chose is consistent with the international evidence. The other key assumption is that if one theme park is attacked, attendance will suffer at all US theme parks.

Our working assumptions are as follows:

1. A cluster consisting of several theme parks in the same Consolidated Metropolitan Statistical Area (CMSA) or Primary Metropolitan Statistical Area (PMSA) and an individual (isolated) theme park are treated as equivalents.
2. A theme park (or cluster) attacked would be closed for one month, would then operate at 30 percent capacity for the next six months and approach normal (pre-attack) levels linearly through to the eighteenth month.<sup>1</sup>
3. The other major theme parks (our sample) in the country would operate at 50 percent of normal capacity for six months and then recover to normal (pre-attack) levels linearly through to the eighteenth month.<sup>2</sup>

Of course, theme park visits are subject to seasonal fluctuations (for example opening hours change during the year), as is international tourism. For example, the peak months in Bali are May and June. We chose to ignore this complication. However, any deviation from our assumptions is easily accommodated within the model.

## RESULTS

We analyzed attacks on 13 theme park complexes in eight states. Two of the complexes were clusters of several parks within the same metropolitan region in Florida and California. We designate them Cluster A (FL) and Cluster B (CA) respectively. Table 12.1 presents a summary of the results. Recall our assumption about the spillover effects on other theme parks not under direct attack, namely that other theme parks in a cluster would suffer the same fate in terms of impacts as if they were directly attacked. A cluster attack would result in an economic impact of \$23.62–24.92 billion. In comparison, the latest estimate of the cost of the 9/11 attack is \$31.7 billion (*New York Times*, 10 July 2005), although it is unclear whether this estimate reflects the full costs of business interruption. Outside the clusters in Florida and California, the impacts would be smaller, in the \$20.75–20.94 billion range, but still sizeable. Of course, this result is a consequence of our specific assumptions that an attack on any major theme park would have nationwide repercussions on all major theme parks. We report below on the most conservative of assumptions, that is, no spillover effects.

The foreign indirect impacts are in the \$415–419 million range except for Florida and California, and \$499 million and \$472 million in these two states. Note that there are no foreign direct impacts because the direct impacts measure the effects on the theme park states. The term ‘foreign’ measures leakages to the rest of the world outside the United States, and these impacts are all indirect. Despite the importance of international tourism, the foreign impacts are quite small but consistent with the 2 percent estimate of international visitors at the theme parks.

The direct impacts are in the range of \$11.82 billion to \$14.19 billion and the indirect impacts fall within a range of \$8.93 billion to \$9.01 billion. The Florida and California clusters have somewhat larger impacts, whereas the impacts of attacks in other states are of similar magnitude.

## THE NO-SPILLOVERS CASE

These results are very sensitive to the spillover effect assumptions. We do not believe that other theme parks in the country would be immune from the effects of an attack on a theme park in another State, but we can combine some of the data in Table 12.1 into another table (Table 12.2) to demonstrate the implications if this belief was incorrect. The data here show the results if the economic impacts are confined to the theme park(s) in the state subject to attack. This is the limiting case of minimal impacts, and is useful from that perspective even if not very realistic. As shown in

Table 12.1 Summary of theme park impacts, \$m

Cluster	Direct			Indirect			Total
	Intrastate	Other theme park states	Total	Intrastate	All other states	Foreign	
Cluster A (FL)	7622.3	6562.7	14185.0	3983.0	6253.8	499.1	10735.9
Cluster B (CA)	5971.0	7499.1	13470.1	3312.3	6361.6	472.0	10146.0
NV	681.2	11263.2	11944.4	326.8	8246.1	417.7	8990.7
FL(i)	5321.6	6562.7	11884.3	2786.3	5770.5	417.2	8974.0
CA(i)	4433.9	7499.1	11933.1	2488.9	6098.4	418.7	9006.0
OH(i)	815.6	11070.2	11885.8	551.9	8018.3	417.7	8987.9
OH(ii)	800.8	11070.2	11871.0	543.2	8015.1	417.1	8975.4
NJ(i)	719.1	11147.0	11866.1	398.9	8134.3	416.2	8949.4
CA(ii)	4400.0	7499.1	11899.1	2470.7	6092.6	417.5	8980.8
NJ(ii)	704.3	11147.0	11851.3	391.6	8131.8	415.7	8939.1
PA	361.6	11474.4	11836.0	286.9	8238.1	415.5	8940.5
VA	308.9	11509.3	11818.1	204.0	8310.1	415.0	8929.1
IL	371.5	11467.8	11839.4	315.8	8210.9	415.7	8942.4



Table 12.2 Theme park impacts: limiting case, no spillovers, \$m

Cluster	Direct	Indirect	Total	Multiplier
Cluster A (FL)	7622.3	3983.0	11 605.3	1.523
Cluster B (CA)	5971.0	3312.3	9283.3	1.555
NV	681.2	326.8	1008.0	1.480
FL(i)	5321.6	2786.3	8107.8	1.524
CA(i)	4433.9	2488.9	6922.8	1.561
OH(i)	815.6	551.9	1367.5	1.677
OH(ii)	800.8	543.2	1344.0	1.678
NJ(i)	719.1	398.9	1117.9	1.555
CA(ii)	4400.0	2470.7	6870.7	1.562
NJ(ii)	704.3	391.6	1095.9	1.556
PA	361.6	286.9	648.6	1.793
VA	308.9	204.0	512.9	1.661
IL	371.5	315.8	687.3	1.850

Table 12.2, the differences are very dramatic, with impacts varying from less than \$0.5 billion in Virginia up to more than \$11.61 billion in the Florida cluster. The economic multipliers are more or less very similar, in the 1.48 to 1.85 range. Remember that these may be underestimates because of the exclusion of induced impacts.

The overall conclusion is that, if there are no spillovers, the terrorist payoff is maximized by attacking a large theme park or a park in a major metropolitan area with many theme parks, such as in Florida or California. On the other hand, if there are significant spillovers, an attack on any known theme park, even one of modest size with presumably less protection because the expense risks are lower, will result in similar nationwide economic impacts. Unfortunately, we do not and will not know which is the more likely scenario unless it happens.

On the other hand, it is a reasonable argument that the spillover scenarios are more plausible. It is our belief that a successful attack on any theme park in the country would have national repercussions. The reason is based on public perception of risks and behavioral adjustments. Given that a theme park visit is a deferrable event and has many attractive alternative vacation trip substitutes, why would a rational person not postpone such a visit by either going elsewhere or staying at home? This behavior is consistent with the hypothesis of 'probability neglect' mentioned above. If valid, any theme park attack would result in nationwide fear, if not panic, and a widespread if temporary shunning of all theme parks. Perception also influences the recovery period. In this research, we have used the Bali (2002)

and the Luxor (1997) attacks as a template for the decline and recovery trajectory. This is probably conservative, given that an American family with children considering a visit to a theme park after an attack might react more cautiously than, say, Australian singles to a holiday in Bali after a bar attack.

## A DIVERSION SCENARIO: THE NATIONAL PARKS

A standard objection to models of the kind used in this research is that, as noted above, declines in final demand are not necessarily net losses. For example, the business interruptions and structural damage associated with a natural disaster, such as an earthquake or a hurricane, are usually offset later by a revival of pent-up demand and an injection of reconstruction funds. There are losses involved, such as the opportunity costs of resources diverted to reconstruction, but there are offsets to many losses.

So it may be in this case. A decline in visitors to theme parks after a terrorist attack is likely to be partially offset by an increase in other, presumably considered safer, types of tourist activities. It is not reasonable to expect everyone to stay home. Thus, part of the change in the tourist scene will be a redistribution of tourist expenditures rather than a total loss. To illustrate this effect, we consider a single substitution scenario to measure the potential offset. Theme park visitors are divided into two categories: day trippers (55 percent) and overnighters (45 percent). We assume that the day trippers stay home. An alternative would be for them to spend the money saved on other items of consumer expenditure. We divert the overnighters to other tourist activities. In the example explored here, we assume – somewhat unrealistically – that they all go to national parks and similar nationally designated destinations. The results of this scenario are reported in Table 12.3.

We consider the maximum impact case, an attack on a theme park in Cluster A (Florida), and reallocate all the lost overnight visitors at all theme parks in the country over the 18-month recovery period to the designated set of national parks and resort areas in proportion to their current visitor levels. We excluded all parks with less than 0.5 million annual visitors, national highways and monuments in New York City and Washington, DC. The consequences are a marked geographical redistribution of tourist expenditures and their impacts because theme parks are typically located in densely populated urban settings while national parks are usually located in lower-density rural settings. Other substitution scenarios, such as a shift to beach holidays, would also have marked, but very different, geographical impacts, perhaps less consequential because of the

Table 12.3 Net impacts of National Parks Diversion Scenario (\$m)

State	Direct Impacts			Indirect Impacts			Total Impacts		
	First year	Second year	Total	First year	Second year	Total	First year	Second year	Total
AL	0.0	0.0	0.0	-57.4	-7.1	-64.5	-57.4	-7.1	-64.5
AK	93.3	11.4	104.8	57.0	7.0	64.0	150.4	18.4	168.8
AZ	441.5	54.1	495.6	210.8	25.9	236.7	652.3	80.0	732.3
AR	126.7	15.5	142.2	54.8	6.7	61.5	181.5	22.2	203.7
CA	-2819.3	-343.2	-3162.5	-1463.5	-178.1	-1641.7	-4282.8	-521.4	-4804.1
CO	218.6	26.8	245.4	117.1	14.4	131.4	335.6	41.1	376.8
CT	0.0	0.0	0.0	-4.1	-0.5	-4.6	-4.1	-0.5	-4.6
DE	0.0	0.0	0.0	0.8	0.1	0.9	0.8	0.1	0.9
DC	120.4	14.8	135.2	52.9	6.5	59.4	173.3	21.2	194.6
FL	-6384.8	-786.7	-7171.5	-3308.4	-407.7	-3716.1	-9693.2	-1194.4	-10887.6
GA	217.2	26.6	243.8	-28.7	-3.6	-32.3	188.6	23.0	211.6
HI	250.0	30.6	280.6	132.7	16.3	149.0	382.7	46.9	429.6
ID	0.0	0.0	0.0	-4.8	-0.6	-5.4	-4.8	-0.6	-5.4
IL	-218.9	-26.7	-245.6	-170.9	-20.9	-191.8	-389.8	-47.6	-437.3
IN	87.9	10.8	98.7	39.0	4.8	43.8	126.9	15.6	142.5
IA	0.0	0.0	0.0	-28.8	-3.5	-32.3	-28.8	-3.5	-32.3
KS	0.0	0.0	0.0	-12.8	-1.6	-14.3	-12.8	-1.6	-14.3
KY	136.8	16.8	153.6	64.3	7.9	72.2	201.1	24.7	225.8
LA	28.9	3.5	32.4	-20.7	-2.5	-23.2	8.2	1.0	9.2
ME	107.2	13.1	120.3	62.5	7.7	70.1	169.7	20.8	190.5
MD	97.2	11.9	109.2	53.2	6.5	59.7	150.4	18.4	168.9
MA	322.3	39.5	361.8	155.8	19.1	174.9	478.1	58.6	536.7
MI	55.0	6.7	61.7	4.3	0.5	4.8	59.2	7.3	66.5

Table 12.3 (continued)

State	Direct Impacts			Indirect Impacts			Total Impacts		
	First year	Second year	Total	First year	Second year	Total	First year	Second year	Total
MN	12.1	1.5	13.6	-6.7	-0.8	-7.5	5.4	0.7	6.1
MS	98.0	12.0	110.0	44.9	5.5	50.4	142.9	17.5	160.4
MO	198.9	24.4	223.3	101.5	12.4	114.0	300.4	36.8	337.2
MT	169.8	20.8	190.6	104.7	12.8	117.5	274.4	33.6	308.1
NE	0.0	0.0	0.0	-35.2	-4.3	-39.5	-35.2	-4.3	-39.5
NV	-116.5	-14.0	-130.6	-56.6	-6.8	-63.5	-173.2	-20.9	-194.0
NH	0.0	0.0	0.0	1.4	0.2	1.5	1.4	0.2	1.5
NJ	-250.8	-30.4	-281.2	-143.3	-17.4	-160.8	-394.1	-47.8	-442.0
NM	20.4	2.5	22.9	13.0	1.6	14.6	33.4	4.1	37.5
NY	359.4	44.1	403.4	154.4	18.9	173.4	513.8	63.0	576.8
NC	338.0	41.4	379.4	159.1	19.5	178.6	497.1	60.9	558.0
ND	0.0	0.0	0.0	-0.7	-0.1	-0.7	-0.7	-0.1	-0.7
OH	-412.8	-50.2	-463.0	-262.3	-31.9	-294.2	-675.0	-82.2	-757.2
OK	61.9	7.6	69.5	33.5	4.1	37.6	95.4	11.7	107.1
OR	0.0	0.0	0.0	-7.4	-0.9	-8.3	-7.4	-0.9	-8.3
PA	193.1	23.8	216.9	84.4	10.4	94.8	277.5	34.2	311.7
RI	0.0	0.0	0.0	-0.5	-0.1	-0.6	-0.5	-0.1	-0.6
SC	44.1	5.4	49.5	11.2	1.4	12.6	55.3	6.8	62.0
SD	173.2	21.2	194.4	103.4	12.7	116.1	276.6	33.9	310.5
TN	249.2	30.6	279.8	115.3	14.1	129.4	364.5	44.7	409.1
TX	218.5	26.8	245.3	-73.7	-9.1	-82.8	144.8	17.7	162.5
UT	365.6	44.8	410.4	213.0	26.1	239.1	578.6	70.9	649.5
VM	0.0	0.0	0.0	-1.2	-0.1	-1.3	-1.2	-0.1	-1.3

VA	168.8	20.8	189.6	91.6	11.3	102.9	260.4	32.1	292.5
WA	271.3	33.3	304.5	132.1	16.2	148.3	403.4	49.5	452.8
WV	55.9	6.9	62.8	31.9	3.9	35.9	87.9	10.8	98.6
WI	0.0	0.0	0.0	-33.3	-4.1	-37.4	-33.3	-4.1	-37.4
WY	234.8	28.8	263.6	154.2	18.9	173.1	389.0	47.7	436.7
US subtotal	-4667.2	-572.4	-5239.6	-3166.2	-388.4	-3554.7	-7833.4	-960.8	-8794.3
Foreign	0.0	0.0	0.0	-155.1	-19.0	-174.1	-155.1	-19.0	-174.1
Total	-4667.2	-572.4	-5239.6	-3321.3	-407.4	-3728.8	-7988.5	-979.9	-8968.4

Notes: \* Unit: \$ millions.

\*\* Final Demand Losses are calculated by each MSA, but are aggregated by state to be used in NIEMO.

relatively high concentration of both theme parks and beaches in Florida and California.

More specifically, the big losers are Florida (\$10.89 billion) and California (\$4.80 billion), with Ohio a distant third (\$0.76 billion). Although California, and to a lesser extent Florida, are well endowed with national park related facilities, their potential positive economic impacts are swamped by losses associated with theme parks. The top gainers are Arizona (\$0.73 billion), Utah (\$0.65 billion), New York (\$0.58 billion), North Carolina (\$0.56 billion), Massachusetts (\$0.54 billion) and Wyoming (\$0.44 billion). At least one-half of these are very low-density, sparsely populated states which presumably would be much safer in terms of the risks of death or injuries to visitors. Overall, the impacts are well dispersed so that no gainer is anywhere near the ballpark of the two main losers. Overall, given the assumptions, the diversion scenario still involves a net loss of \$8.97 billion.

## THE DISTRIBUTION OF GEOGRAPHICAL IMPACTS

One question is the sensitivity of the spatial distribution of indirect impacts to the location(s) of the direct impact. To test this, we assumed a \$100 million decline in theme park revenues in each of the nine major theme park states. Note that for this simple test, we did not include the ripple effects of revenue losses at theme parks in states other than in the state attacked, so this analysis is somewhat distinct from the other scenarios discussed in this paper. The results are displayed in Table 12.4. They are not surprising. More than 90 percent of the impacts are intrastate, and the interstate impacts reflect a significant distance decay effect. In other words, the proportionate indirect impacts tend to be larger in states that are nearby to the state where the direct impacts occur.

## CONCLUSIONS

This study reports on a preliminary analysis of the economic impacts of terrorist attacks on America's more prominent theme parks. A key assumption of the research is that in the public's psyche, an attack on one theme park will be perceived as an attack on all. However, we also report results of a more conservative assumption, specifically that of a 'no spillover' effect. We also recognize that even a major terrorist attack on a theme park will not ruin American vacation habits. Vacationers will probably switch to holidays considered safer. We examine one scenario: substituting visits to national parks, and their low-density environments, for theme parks.

The results can be easily summarized. In the spillover cases, even an attack on a moderately sized theme park will result in more than a \$20 billion hit to the economy. An attack on a cluster could result in \$25 billion of economic damages. In addition, the loss in airline revenues could run as high as almost \$12 billion. These numbers combined are in the same neighborhood as the costs of the 9/11 disaster. On the other hand, if the repercussions are constrained in terms of spillovers, the impact could be as low as \$513 million or as high as \$11.6 billion, depending upon which theme park was attacked. In the diversion scenario, that is, substitution of national parks for theme parks, there still is an economic loss as some people will stay home, increase their savings and plan a vacation for the following year. However, there is a significant offset. Florida and California are net losers, because even though they have important national parks their economic impacts are modest compared with their theme parks. The big winners, that is, in terms of net gains, are sparsely populated states with rich natural and recreational resources, such as Arizona, Utah and Wyoming.

## POLICY IMPLICATIONS

Because of the scarcity of both Department of Homeland Security and private sector resources, any study of the economic impact of a terrorist attack needs to consider the cost-effectiveness of the scale and scope of alternative prevention measures. It is somewhat easier to do this with economic impact analyses because they generate implicit guidelines on how much it is worth to spend. The economic impact estimates in this study are sizeable, yet are probably underestimates because of our exclusion of induced impacts and our focus on only the largest theme parks. They certainly justify significant expenditures on prevention, probably much more than those (based on anecdotal evidence) currently in place. The problem is the distribution of those expenditures among theme parks. In the spillovers scenarios, even the smaller theme parks are attractive terrorist targets because they are less protected, but may have nationwide economic impacts almost as damaging as in the case of a cluster attack. If such scenarios are considered more probable, there are certain implications.

For example, it may pay DHS to subsidize, or offer other incentives for, prevention measures in smaller theme parks. In no-spillovers scenarios, the implication is to focus on the larger theme parks, especially in the clusters. Also, if there is a case for subsidies in these cases, the providers should be local or state entities because the externalities will be more local than national. However, we suspect that, regardless of spillovers or not, the most

Table 12.4 Interstate impacts of a \$100 m direct loss in theme park states, \$m

State	Total impacts															
	CA	%	FL	%	IL	%	NV	%	NJ	%	OH	%	PA	%	VA	%
AL	0.26	0.1%	1.00	0.6%	0.31	0.2%	0.11	0.1%	0.29	0.2%	0.58	0.3%	0.18	0.1%	0.25	0.1%
AK	0.08	0.0%	0.02	0.0%	0.02	0.0%	0.02	0.0%	0.01	0.0%	0.05	0.0%	0.01	0.0%	0.06	0.0%
AZ	0.44	0.3%	0.10	0.1%	0.08	0.0%	0.21	0.1%	0.05	0.0%	0.07	0.0%	0.07	0.0%	0.08	0.0%
AR	0.44	0.3%	0.46	0.3%	0.43	0.2%	0.13	0.1%	0.16	0.1%	0.50	0.3%	0.40	0.2%	0.21	0.1%
CA	153.51	88.2%	1.28	0.7%	1.51	0.8%	5.27	3.2%	1.18	0.7%	1.25	0.7%	1.17	0.7%	0.91	0.5%
CO	0.34	0.2%	0.18	0.1%	0.60	0.3%	0.11	0.1%	0.14	0.1%	0.28	0.2%	0.14	0.1%	0.22	0.1%
CT	0.09	0.0%	0.15	0.1%	0.10	0.1%	0.09	0.1%	0.21	0.1%	0.11	0.1%	0.18	0.1%	0.15	0.1%
DE	0.04	0.0%	0.04	0.0%	0.03	0.0%	0.01	0.0%	0.18	0.1%	0.04	0.0%	0.14	0.1%	0.62	0.3%
DC	0.01	0.0%	0.01	0.0%	0.01	0.0%	0.01	0.0%	0.01	0.0%	0.01	0.0%	0.01	0.0%	0.05	0.0%
FL	0.24	0.1%	152.00	86.2%	0.24	0.1%	0.16	0.1%	0.34	0.2%	0.49	0.3%	0.36	0.2%	0.35	0.2%
GA	0.24	0.1%	2.46	1.4%	0.40	0.2%	0.14	0.1%	0.61	0.4%	0.67	0.4%	0.56	0.3%	0.79	0.4%
HI	0.11	0.1%	0.03	0.0%	0.04	0.0%	0.02	0.0%	0.02	0.0%	0.03	0.0%	0.02	0.0%	0.04	0.0%
ID	0.29	0.2%	0.09	0.1%	0.16	0.1%	0.06	0.0%	0.09	0.1%	0.17	0.1%	0.08	0.0%	0.06	0.0%
IL	0.87	0.5%	1.02	0.6%	155.75	87.2%	0.30	0.2%	0.64	0.4%	1.48	0.8%	0.87	0.5%	0.73	0.4%
IN	0.35	0.2%	0.39	0.2%	0.99	0.6%	0.19	0.1%	0.30	0.2%	1.03	0.6%	0.36	0.2%	0.69	0.4%
IA	0.78	0.5%	0.41	0.2%	1.42	0.8%	0.14	0.1%	0.37	0.2%	0.63	0.3%	0.38	0.2%	0.31	0.2%
KS	0.56	0.3%	0.18	0.1%	0.51	0.3%	0.15	0.1%	0.80	0.5%	0.52	0.3%	0.15	0.1%	0.60	0.3%
KY	0.20	0.1%	0.35	0.2%	0.46	0.3%	0.11	0.1%	0.18	0.1%	0.96	0.5%	0.31	0.2%	0.65	0.4%
LA	0.55	0.3%	0.71	0.4%	0.47	0.3%	0.19	0.1%	0.17	0.1%	0.26	0.1%	0.24	0.1%	0.28	0.2%
ME	0.08	0.0%	0.06	0.0%	0.08	0.0%	0.02	0.0%	0.06	0.0%	0.05	0.0%	0.12	0.1%	0.07	0.0%
MD	0.07	0.0%	0.08	0.0%	0.10	0.1%	0.05	0.0%	0.29	0.2%	0.10	0.1%	0.44	0.2%	1.21	0.7%
MA	0.14	0.1%	0.21	0.1%	0.15	0.1%	0.11	0.1%	0.26	0.2%	0.18	0.1%	0.21	0.1%	0.24	0.1%
MI	0.45	0.3%	0.56	0.3%	0.71	0.4%	0.31	0.2%	0.57	0.3%	1.68	0.9%	0.57	0.3%	0.80	0.4%
MN	0.55	0.3%	0.32	0.2%	0.90	0.5%	0.17	0.1%	0.32	0.2%	0.72	0.4%	0.39	0.2%	0.28	0.2%
MS	0.15	0.1%	0.34	0.2%	0.24	0.1%	0.06	0.0%	0.13	0.1%	0.23	0.1%	0.16	0.1%	0.16	0.1%
MO	0.39	0.2%	0.30	0.2%	0.73	0.4%	0.74	0.5%	0.40	0.2%	0.36	0.2%	0.34	0.2%	0.29	0.2%



MT	0.17	0.1%	0.03	0.0%	0.21	0.1%	0.03	0.0%	0.03	0.0%	0.04	0.0%	0.04	0.0%	0.04	0.0%	0.02	0.0%	0.02	0.0%
NE	0.68	0.4%	0.53	0.3%	0.55	0.3%	0.09	0.1%	0.27	0.2%	0.55	0.3%	0.55	0.3%	0.54	0.3%	0.27	0.1%	0.27	0.1%
NV	0.13	0.1%	0.03	0.0%	0.02	0.0%	146.93	89.7%	0.02	0.0%	0.03	0.0%	0.03	0.0%	0.02	0.0%	0.02	0.0%	0.02	0.0%
NH	0.05	0.0%	0.04	0.0%	0.04	0.0%	0.03	0.0%	0.03	0.0%	0.04	0.0%	0.04	0.0%	0.06	0.0%	0.06	0.0%	0.06	0.0%
NJ	0.31	0.2%	0.46	0.3%	0.41	0.2%	0.14	0.1%	149.39	88.2%	0.36	0.2%	0.36	0.2%	0.70	0.4%	0.40	0.2%	0.40	0.2%
NM	0.06	0.0%	0.07	0.0%	0.07	0.0%	0.04	0.0%	0.04	0.0%	0.08	0.0%	0.08	0.0%	0.05	0.0%	0.03	0.0%	0.03	0.0%
NY	0.42	0.2%	0.50	0.3%	0.49	0.3%	0.20	0.1%	1.54	0.9%	0.79	0.4%	0.79	0.4%	1.57	0.9%	0.65	0.4%	0.65	0.4%
NC	0.26	0.1%	0.77	0.4%	0.28	0.2%	0.13	0.1%	0.44	0.3%	0.60	0.3%	0.60	0.3%	0.61	0.3%	2.11	1.2%	2.11	1.2%
ND	0.10	0.1%	0.05	0.0%	0.17	0.1%	0.06	0.0%	0.06	0.0%	0.12	0.1%	0.12	0.1%	0.11	0.1%	0.04	0.0%	0.04	0.0%
OH	0.53	0.3%	0.71	0.4%	0.85	0.5%	0.54	0.3%	0.66	0.4%	158.75	86.4%	1.12	0.6%	0.86	0.5%	0.86	0.5%	0.86	0.5%
OK	0.31	0.2%	0.22	0.1%	0.21	0.1%	0.13	0.1%	0.16	0.1%	0.19	0.1%	0.19	0.1%	0.14	0.1%	0.15	0.1%	0.15	0.1%
OR	0.48	0.3%	0.12	0.1%	0.20	0.1%	0.18	0.1%	0.09	0.1%	0.20	0.1%	0.20	0.1%	0.08	0.0%	0.10	0.1%	0.10	0.1%
PA	0.47	0.3%	0.65	0.4%	0.59	0.3%	0.34	0.2%	1.86	1.1%	1.24	0.7%	1.24	0.7%	157.60	87.9%	1.56	0.9%	1.56	0.9%
RI	0.03	0.0%	0.05	0.0%	0.02	0.0%	0.03	0.0%	0.04	0.0%	0.05	0.0%	0.05	0.0%	0.04	0.0%	0.04	0.0%	0.04	0.0%
SC	0.11	0.1%	0.37	0.2%	0.14	0.1%	0.07	0.0%	0.12	0.1%	0.28	0.2%	0.28	0.2%	0.20	0.1%	0.37	0.2%	0.37	0.2%
SD	0.18	0.1%	0.07	0.0%	0.20	0.1%	0.04	0.0%	0.06	0.0%	0.22	0.1%	0.22	0.1%	0.13	0.1%	0.07	0.0%	0.07	0.0%
TN	0.29	0.2%	0.53	0.3%	0.30	0.2%	0.16	0.1%	0.38	0.2%	0.48	0.3%	0.48	0.3%	0.39	0.2%	0.85	0.5%	0.85	0.5%
TX	2.52	1.4%	3.50	2.0%	0.94	0.5%	2.01	1.2%	1.95	1.1%	0.99	0.5%	0.99	0.5%	2.50	1.4%	1.21	0.7%	1.21	0.7%
UT	0.29	0.2%	0.11	0.1%	0.08	0.0%	0.19	0.1%	0.04	0.0%	0.09	0.1%	0.09	0.1%	0.07	0.0%	0.06	0.0%	0.06	0.0%
VM	0.03	0.0%	0.04	0.0%	0.05	0.0%	0.01	0.0%	0.04	0.0%	0.03	0.0%	0.03	0.0%	0.06	0.0%	0.03	0.0%	0.03	0.0%
VA	0.13	0.1%	0.27	0.2%	0.30	0.2%	0.09	0.1%	0.27	0.2%	0.36	0.2%	0.36	0.2%	0.47	0.3%	157.67	86.7%	157.67	86.7%
WA	0.93	0.5%	0.25	0.1%	0.25	0.1%	0.27	0.2%	0.15	0.1%	0.22	0.1%	0.22	0.1%	0.18	0.1%	0.16	0.1%	0.16	0.1%
WV	0.05	0.0%	0.05	0.0%	0.06	0.0%	0.03	0.0%	0.06	0.0%	0.73	0.4%	0.73	0.4%	0.26	0.1%	0.80	0.4%	0.80	0.4%
WI	0.70	0.4%	0.63	0.4%	1.97	1.1%	0.26	0.2%	0.58	0.3%	1.00	0.5%	1.00	0.5%	0.85	0.5%	0.50	0.3%	0.50	0.3%
WY	0.06	0.0%	0.02	0.0%	0.17	0.1%	0.07	0.0%	0.02	0.0%	0.06	0.0%	0.06	0.0%	0.03	0.0%	0.02	0.0%	0.02	0.0%
US sub total	170.51	98.0%	172.85	98.0%	174.99	98.0%	160.97	98.3%	166.09	98.0%	179.95	97.9%	179.95	97.9%	175.67	98.0%	178.20	98.0%	178.20	98.0%
Foreign	3.45	2.0%	3.54	2.0%	3.63	2.0%	2.87	1.7%	3.33	2.0%	3.78	2.1%	3.78	2.1%	3.59	2.0%	3.67	2.0%	3.67	2.0%
Total	173.96	100.0%	176.39	100.0%	178.61	100.0%	163.84	100.0%	169.42	100.0%	183.73	100.0%	183.73	100.0%	179.26	100.0%	181.87	100.0%	181.87	100.0%

Note: \* \$100m are distributed according to sector proportions, which are adopted from the proportions in Cluster B.

visible theme parks, nationally and/or internationally, are the most vulnerable because of their symbolic value as representatives of American culture.

Rather than relying on government subsidies, a self-help strategy might be both preferable and more feasible, depending upon whether the Terrorism Risk Insurance Act is eventually abolished. Especially in the spillovers scenarios, there is a strong case for both co-insurance and collaborative joint-prevention programs whereby the association of theme park owners get together to pool both human and financial resources and expertise. This is particularly important for the smaller theme parks that may lack the internal resources to mount adequate prevention and mitigation programs or even to cover the insurance risks. It is rational for the large theme park owners to promote and participate in such an approach because a simultaneous attack on theme parks in more than one state is extremely unlikely on logistical grounds. So, even though an attack on an internationally known theme park is more likely because of its publicity effects, an attack on a much smaller theme park would be easier and less costly and would (on the assumption of spillovers) result in almost as much national economic damage.

## NOTES

1. The calculation is as follows:  
 Let the  $i$  month be  $M_i$  and the  $j$  year be  $Y_j$ , where  $i = 1, \dots, 18$  and  $j = 1$  and  $2$ .  
 $M_i = (\text{Raw\_Data})/12$ .  
 $M_i = M_i - M_i*0.3 = M_i*0.7$ , where  $i = 2, \dots, 7$ .  
 Also,  $M_i = M_i - M_i*0.3 - M_i*0.7*(i-7)/(18-7) = M_i*0.7*(1 - (i-7)/11)$ ,  
 where  $i = 8, \dots, 18$ .  
 Hence,  $Y_1 = \sum_{i=1}^{12} M_i = M_1[1 + 0.7*6 + 0.7*\{5 - (1 + \dots + 5)/11\}]$  and  $Y_2 = \sum_{i=13}^{18} M_i = M_1*0.7*\{6 - (6 + \dots + 11)/11\}$ .
2. Similarly to Note 1, by letting the  $j$  year be  $Y_j$ ,  $Y_1' = \sum_{i=1}^{12} M_i = M_1*0.5[6 + 0.5*\{6 - (1 + \dots + 6)/12\}]$  and  $Y_2' = \sum_{i=13}^{18} M_i = *0.5*\{6 - (7 + \dots + 12)/12\}$ .

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